UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/516,714	02/06/2006	Vincent Le Nir	F40.12-0030	6619

27367 7590 06/29/2010

WESTMAN CHAMPLIN & KELLY, P.A.
SUITE 1400
900 SECOND AVENUE SOUTH
MINNEAPOLIS, MN 55402

EXAMINER	
FLORES, LEON	

ART UNIT	PAPER NUMBER
2611	

MAIL DATE	DELIVERY MODE
06/29/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/516,714	LE NIR ET AL.	
	Examiner	Art Unit	
	LEON FLORES	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 May 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) *2 and 11* is/are withdrawn from consideration.

5)☒ Claim(s) *12* is/are allowed.

6)☒ Claim(s) *1,3-6 and 8-10* is/are rejected.

7)☒ Claim(s) *7* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims (1 & 9) have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. **Claims (1, 3-6, 8) are rejected under 35 U.S.C. 103(a) as being unpatentable over Marzetta (US Patent 6,307,882 B1) in view of Agrawal et al. (hereinafter Agrawal) (US Patent 6,873,606 B2)**

Re claim 1, Marzetta discloses a method for sending a signal implementing implemented by a system comprising Nt transmit antennas, with $Nt \geq 2$, wherein the method implements the following steps, for at least one vector comprising N symbols to

be sent: dividing said vector into Nt sub-vectors (See fig. 1: 12, 14 & col. 2, line 60 – col. 3, line 2, col. 3, lines 34-36), wherein the step of dividing is performed by the system.

But the reference of Marzetta fails to teach multiplying each of the Nt sub-vectors by a distinct sub-matrix sized (N/Nt,N), where N/Nt is an integer, each sub-matrix being associated with one of the transmit antennas, and said sub-matrices being obtained by subdivision of a unitary square matrix sized (N,N), and wherein the step of multiplying is performed by the system; and sending, from the Nt transmit antennas, the Nt sub-vectors resulting from the multiplying step.

However, Agrawal does. (See figs. 1, 3-4 & col. 5, lines 10-31) Agrawal suggests multiplying each of the Nt sub-vectors (See equation 5 "Xi" by a distinct sub-matrix sized (N/Nt,N) (See equation 5 "Mki". When Nt is equal to 2, equation 5 computes a squared matrix M comprised of elements M11, M12, "first row" and elements M21, M22 "second row, wherein first row is transmitted via the first antenna and the second row via the second antenna. This can be easily shown from equation 5 when Nt is equal to 2.), where N/Nt is an integer, each sub-matrix being associated with one of the transmit antennas (See equation 5 "Mki"), and said sub-matrices being obtained by subdivision of a unitary square matrix sized (N,N) (See col. 6, lines 11-29 including equations 10-11), and wherein the step of multiplying is performed by the system; and sending, from the Nt transmit antennas, the Nt sub-vectors resulting from the multiplying step. (See figs. 1, 3-4)

Therefore, taking the combined teachings of Marzetta & Agrawal as a whole, it would have been obvious to one of ordinary skills in the art to incorporate these features

into the system of Marzetta, in the manner as claimed and as taught by Agrawal, for the benefit of satisfying the per-antenna power constraint.

Re claim 3, the combination of Marzetta & Agrawal further discloses that wherein N/Nt is greater than or equal to 2. (In Agrawal, see col. 5, lines 10-31)

Re claim 4, the combination of Marzetta & Agrawal further discloses that wherein said unitary matrix is full. (In Agrawal, see col. 5, lines 10-31, col. 6, lines 11-28)

Re claim 5, the combination of Marzetta & Agrawal further discloses that wherein said unitary matrix belongs to the group comprising: the real Hadamard matrices; the complex Hadamard matrices; the Fourier matrices; the real rotation matrices; the complex rotation matrices. (In Agrawal, see col. 6, lines 11-28)

Re claim 6, the combination of Marzetta & Agrawal further discloses that wherein implements two transmitter antennas and said sub-matrices have a value of [1 1] and [1 -1]. (In Agrawal, see col. 5, lines 10-39, col. 6, lines 11-28)

Re claim 8, the combination of Marzetta & Agrawal further discloses that wherein the method implements four transmitter antennas and that said sub-matrices have a value $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}, \begin{bmatrix} 1 & -1 \\ 1 & -1 \end{bmatrix}, \begin{bmatrix} 1 & 1 \\ -1 & -1 \end{bmatrix}$ and $\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$.

(In Agrawal, see col. 5, lines 10-31, col. 6, lines 11-28)

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. **Claims (1, 9-10) are rejected under 35 U.S.C. 102(b) as being anticipated by Onggosanusi et al. (hereinafter Onggosanusi) (US Publication 2002/0196842 A1)**

Re claim 1, Onggosanusi discloses a method for sending a signal implementing implemented by a system comprising Nt transmit antennas, with $Nt \geq 2$, wherein the method implements the following steps, for at least one vector comprising N symbols to be sent: dividing said vector into Nt sub-vectors (See fig. 2: 22), wherein the step of dividing is performed by the system: multiplying each of the Nt sub-vectors by a distinct sub-matrix sized (N/Nt,N), where N/Nt is an integer, each sub-matrix being associated with one of the transmit antennas (See fig. 2: 58 & ¶s 23-26), and said sub-matrices being obtained by subdivision of a unitary square matrix sized (N,N) (See equations 12-13, 16), and wherein the step of multiplying is performed by the system; and sending, from the Nt transmit antennas, the Nt sub-vectors resulting from the multiplying step. (See fig. 2)

Re claim 9, Onggosanusi discloses a method for reception of a signal corresponding to a combination of contributions of Nt transmit antennas, with $Nt \geq 2$, wherein for at least one vector comprising N symbols to be sent, the signal is generated

by dividing said vector into Nt sub-vectors, multiplying each of the Nt sub-vectors by a distinct sub- matrix sized (N/Nt,N), where N/Nt is an integer, each sub-matrix being associated with one of the transmit antennas, and said sub-matrices being obtained by subdivision of a unitary square matrix sized (N,N), and sending, from the Nt transmit antennas, the Nt sub-vectors resulting from the multiplying step, wherein the signal forms, seen from a receiver, a single combined signal representing the multiplication, wherein the method of reception comprises: implementing the method by a system comprising at least one receiver antenna (See fig. 2: 54); receiving said single combined signal on each of said receiver antennas by the system (See fig. 2: RAT3 & RAT4 & ¶s 19-20); and decoding said single combined signal by the system with a decoding matrix corresponding to a matrix that is the conjugate transpose of said unitary matrix. (See fig. 2 & ¶ 30)

Re claim 10, Onggosanusi further discloses that wherein a maximum likelihood decoding is applied to the data coming from the multiplication by said conjugate transpose matrix. (See fig. 2 & ¶ 30)

Allowable Subject Matter

7. Claim 12 is allowed.

8. Claim 7 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LEON FLORES whose telephone number is (571)270-1201. The examiner can normally be reached on Mon-Fri 7-5pm Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Leon Flores/
Examiner, Art Unit 2611
June 22, 2010